

Remarks

Applicant requests reconsideration of the application in view of the remarks below.

Telephone Interview

Applicant's representative conducted a telephone interview with Examiner Hannon on April 9, 2009. The substance of the interview is discussed below.

Rejection under 35 U.S.C. § 103(a)

The Office action rejects claims 1, 2, 6-11, 13, 16, 18, and 19 under 35 U.S.C. § 103(a) over U.S. Patent No. 5,660,482 (Newley) in view of GB Patent No. 2,170,279 (Harrison). This rejection is respectfully traversed for the reasons set forth below.

Claim 1 concerns a self-lubricating bearing having a self-lubricating liner and a counterface surface in close sliding contact therewith, the counterface surface having a surface finish of less than 20 nm and a hardness of less than in the region of 1000 VPN. The action alleges that the chromium plated inner surface 2 of Newley's bearing constitutes a self-lubricating liner. The action states that because the chromium plating is provided "to avoid galling between the cooperating surfaces," the chromium plating is therefore a self-lubricating liner under the broadest reasonable interpretation of the term. Applicant disagrees.

A "self-lubricating" bearing liner is a term of art that must be construed as would be understood by one skilled in the art. As was pointed out by Applicant's representative in the telephone interview, for a material to be "self-lubricating," it must be capable of providing a substance which forms a film of lubricant between two bearing surfaces. One example of a self-lubricating material disclosed in the present application is PTFE. In use, some of the PTFE material is removed from the liner, due to abrasive wear, and deposited on the opposing bearing surface to form an additional film of PTFE material thereon. Subsequent wear is thus much decreased and is known as "adhesive wear."

Attached hereto as Exhibit A is a description of self-lubricating bearings from Kempe's Engineers Year-Book (1998), which describes several examples of self-lubricating bearings. As described in this reference, metal bearing liners, such as bronze liners, must be combined with a lubricant, such as by impregnating the bronze with filled PTFE. Also, reference can be made to the Background section of U.S. Patent No. 7,320,549 for a brief description of conventional bearings (which require a lubricant such as grease) and self-lubricating bearings (in which a layer of lubricant is provided by the lining material itself). Examples of convention materials from which self-lubricating

bearings are made include “copper alloys such as bronze, aluminum bronze, manganese bronze and hardened steel and steel-backed copper alloy structures.” To impart lubricating properties to the bearing, the surface of the metal is provided with pockets or cavities into which a lubricating component is held. In use, a thin layer of the lubricating material is distributed from the pockets or cavities between the bearing surfaces. See col. 1, lines 54-63 of the ‘549 patent.

Also attached as Exhibit B is the entry for the term “Lubrication” from The New Encyclopedia Britannica, 15th Edition, which describes several types of solid lubricants. As described in this reference, soft metals, such as lead, tin and indium, placed on a hard substrate can act as effective lubricants. See page 171.

By comparison, chrome itself (as used in Newley) is not a self-lubricating material. Instead, chrome is a very hard substance and if chrome particles were to break free from either surface, they would scratch and destroy the bearing surfaces, rather than form a lubricating layer as required of a self-lubricating bearing. As is well known in the art, a chrome bearing would require the provision and periodic replenishment of grease, oil and/or dry film lubricant, because chrome is not self-lubricating.

In short, the claim term “self-lubricating liner” in claim 1 must be given its meaning within the art; that is, a liner that creates a layer of lubricating material between the two bearing surfaces. Because the chrome plating of Newley is not a self-lubricating liner, Newley does not meet the limitations of claim 1. Harrison also does not teach or suggest a self-lubricating liner. For at least these reasons, claim 1 is not obvious over the combination of Newley and Harrison, and this rejection should be withdrawn.

Claims 2 and 6-8 depend from claim 1 and are thus nonobvious over Newley and Harrison for at least the same reasons claim 1 is nonobvious, and because each dependent claim recites a distinctly patentable combination of features.

Independent claim 9 concerns a method of constructing a self-lubricating bearing comprising providing a self-lubricating liner in sliding contact with a counterface surface having a surface finish of less than 20 nm and a hardness of less than 1000 VPN. Neither Newley nor Harrison teaches or suggests a bearing having a self-lubricating liner. Hence, claim 9 is not rendered obvious by Newley or Harrison (alone or in combination), and the rejection of claim 9 should be withdrawn.

Claims 10, 13, 16 depend from claim 9 and are nonobvious over Newley and Harrison for at least the same reasons claim 9 is nonobvious, and because each dependent claim recites a distinctly

patentable combination of features.

Independent claim 11 concerns a method of operating a self-lubricating bearing having a self-lubricating liner in sliding contact with a counterface surface having a surface finish of less than 20 nm and a hardness of less than 1000 VPN. Neither Newley nor Harrison teaches or suggests a bearing having a self-lubricating liner. Thus, claim 11 cannot be obvious over Newley and Harrison and the rejection of claim 11 should be withdrawn.

Claims 18 and 19 depend from claim 11 and are thus nonobvious over Newley and Harrison for at least the same reasons claim 11 is nonobvious, and because each dependent claim recites a distinctly patentable combination of features.

Accordingly, applicants respectfully request that the rejections under 35 U.S.C. § 103(a) over Newley and Harrison be withdrawn. The Examiner is invited to telephone the undersigned attorney at the telephone number provided with any questions regarding this response.

Respectfully submitted,

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1998

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Alternative surface layers being tried are a 3-micron thick zinc phosphate bonded layer on aluminum alloy, a magnetron sputtered layer of aluminum/tin on lead bronze and lead/indium filled surface indents in copper/lead with a thin coating of indium diffused into the copper/lead to prevent corrosion and improve surface properties. Self-lubricating bearings. The idea of bonding a bearing material to a thin steel backing has also been successfully applied to dry and maintenance-free bearings. One example is porous bronze lined bearings impregnated with filled PTFE, available commercially as Glacier DP, DP3, and DU, Glycodur F and Daidyne. Bearings of this type have been on the market for over 35 years and have proved very successful in numerous applications where low unlubricated friction and high load capacity are sought. Glacier DU and similar materials combine the unique dry friction properties of PTFE with high compressive yield strength (up to 300 MPa), good heat conductivity (around 40 W/mK at right angles to the strip compared with 0.26 for PTFE) and excellent dry wear resistance. Probably the largest single application is in vehicle front suspension Macpherson struts where they are in contact with hydraulic fluid and give the low stick-slip-free friction demanded for a comfortable vehicle ride.

Woven PTFE fibres with glass or textile fibres resin bonded to a steel backing (Amper Fiberglide) are very effective for low speed very high load applications such as aircraft airframe bearings where operation at temperatures from -50 to $+200^{\circ}\text{C}$ is required. Dry friction coefficient values of 0.04 are found with bearing loads around 350 MPa. The compressive yield strength of these materials is up to 1000 MPa. Other ways of combining dry lubricants with metal bearings are by means of indents or drilled holes in the metal surface (Franberlube, Giles 800, Permafilide) or by greasing dry lubricant into the pores of woven metal wire mesh (Metalloplast, Unimesh) or the holes in perforated metal sheet (HY-Load). Metallic dry bearings are also made by moulding and sintering mixtures of powdered metals and carbon/graphite powder.

The use of a porous metal sinter to bond a bearing plastic to a steel backing has been used for pre-lubricated bearings lined with polyacetal or filled PEEK (poly ether ether ketone). These materials give long lives with initial grease lubrication and can be used as greased-for-life bearings. They are also suitable alternatives to steel backed white metal for temperatures up to 120°C in the case of polyacetal (Glacier DX) or 200°C with PEEK (Glacier Hi-Ex).

It is at very low temperatures, below -30°C , and high temperatures, above 200°C , that dry bearings come into their own. Beyond these extremes liquid lubricants are ineffective whereas dry lubrication can be extended down to liquid nitrogen temperatures or up to 1000°C or higher.

Coatings. An increasingly popular method of dry lubrication is by means of a coating applied to the component itself.

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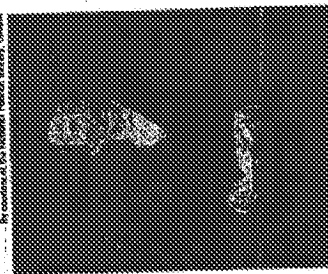
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Battled explorations. For the next 15 years, Livingston was consistently on the move into the African interior, attempting to strengthen his missionary determination, responding enthusiastically to the desires of geographical discovery, and working with the Shona and the Tsvanans, whose treatment of the Africans he came to detest, and building for himself a remarkable reputation as a dedicated Christian, a courageous explorer, and a fervent antislavery advocate. Yet so impractical was his commitment to Africa—so much so that he and his wife were relegated to what he called as husband and father were relegated to

[illegible]

On January 7, 1845, Liddington married Maria's daughter, Mary, and she accompanied him on many of his journeys and her husband and the family's needs for security and comfort were taken care of and their own children were brought to Britain in 1852. Before this time, when Maria was still in England, Liddington had already achieved nothing with his theory. Liddington had already achieved nothing with his theory. Liddington had already achieved nothing with his theory.

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Exsurgens, as painted by F. David (1806), after Philippe, in the National Portrait Gallery.

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1987

public lectures (which was a modern innovation) gave him a reputation, and probably also leading in court. After a year of grace he went on to Italy and Spain (modern times), where there was at the time no salary, as at Athens, where there was one. He was very successful, giving microscopical study for Greek orators. To this period of his life belong many of his surviving documents on morphology and other such things (*Prodr.*, *De Theophrast.*, *Hippocr.*, *In Fraite of the City*) and the most important of his philosophical works, *De Animalibus* and *De Vegetabilibus* (including *Brachylogus* and *The Periphrasis*). His *De Animalibus* was evidently successful in a professional way, for it earned much profit and also great honors on the part of the authorities. He won the friendship of distinguished physicians, and, as a result, of the great physicians, Galen, Aretaeus, Soranus, and priviledged governors and magistrates. He was also very successful in the case of the emperor well-known in literary circles throughout the empire. Domitian he earned a comfortable income, sum 316 sesterces annually, however, to have reached the first rank in

It may have been disillusion with the complexity of his career that led him to give up his wandering life and settle in Athens in the late 1860s of the last century. From there he attended the Olympic Games of 1876, doubtless as a public speaker. To Athens, then a centre of Hellenistic culture, he brought the message of the new Olympic movement.

He was able to extend his knowledge of Greek literature and thought far beyond anything required of a theatrical artist. As well as Aeschylus and classical and Hellenistic philosophy, he read the satirical pamphlets and treatises of the 3rd-century-a.c. Cynic philosopher Menippus of Gadara (a fellow Syrian), which deeply impressed him. In this early Athenian period Lucian gave up public

[illegible]

Verna, whose misadventure Pambour had entered in his log-book, when he probably accompanied Verna to Antioch in 1822, when the Explorer went to take the field against the Peribarbans. At any rate, he spent some years in Antioch about this time. From there he made a return visit to his native Samosata, where, to an admiring audience of the fellow townsmen, he delivered a speech on his own career. "The Congress of Antioch," says *The Nation's* reviewer,

father back to Athens with him. They probably crossed Asia Minor and sailed westward from Anaxartes (Anagartus) during this journey. Lucian met the popular magician and wonder-worker, Alexander of Abrodonneia (the modern Irbid), a character whom he depicted brilliantly in *Alexander*, or *The False Prophet*. Another whom he acquainted to at this time was a convert from Christianity, the Cynic philosopher Peregrinus, his fellow passenger on the Troad (the first time by the way).

city of Troy (see Mazon) to Athens. Returning to Athens, Lucius visited the Olympic Games of 163, at which Ptolemy's translation contest by sending his own Greek version of the *Phaedrus* had won him the prize. Ptolemy had been disappointed that his own version had not won, and now he was to see his rival's triumph. He was to be disappointed again, for his rival's version had won the prize. Ptolemy's version had won the prize. Ptolemy's version had won the prize.

in particular *Colus Calvinae* Stenobius, perfect at Egypt from 1740 to 1750—was obtained a year in Alexandria as *arabidator*, a kind of chad curat outer. The representative

major producers	1940	1970
United States	...	181
South Africa	...	112
Mexico	9,770	11,560
Iran	8,560	9,470
United States	...	713
British Petroleum	...	3,066

World Population	200	546
Europe	270	740
Asia	680	2,140
Japan	376	5,183
Europe	3,610	7,020
United Kingdom	577	1,234
Commonwealth	586	1,281
Commonwealth Rep. of	30	65
Common	30	65
Australia	20	500

and Handbook of Lubrication Engineering (1982), on lubrication theory, tribological properties, bearings, and applications of specific polymers; e.g., reaction, *Lubrication* (1972); *Handbook of Tribology and Bearing Technology*, Vol. 1, *Tribology* (1976); *Handbook of Tribology and Bearing Technology*, Vol. 2, *Bearing Technology*; Nasa Spc-380 (1964) with special reference to aerospace applications; v.a. *ASTM* (1964). Petroleum Products Handbook (1960), on the properties, characteristics, storage and handling, and utilization of petroleum products; AMERICAN PETROLEUM INSTITUTE, *Petroleum Facts and Figures* (1967).

(3.8.)



er writings of Locke, a Greek philosopher, perceptible, and midst of the 2nd century AD, are contradictory in their treatment and methods of, revealing a sophisticated and often complicated mixture of the Hellenic and the Christian. The 17th century, philosophy, and intellectual life of the West, which has been called the Golden Age of the 17th century, was largely destructive and could suggest no new values.

to put in place of these had to be attacked as contemptuous. The *Journal* was not only a great success, but it was, like *Chen*, ill at ease in a gentlemanly and sophisticated world. The only thing that was common to the two was that they were both written by a self-confessed dilettante. The only thing that he had read before he wrote it was *Le roman expérimental* by the French novelist, Marcel Schwob. The only thing that he had read before he wrote it was *Le roman expérimental* by the French novelist, Marcel Schwob. The only thing that he had read before he wrote it was *Le roman expérimental* by the French novelist, Marcel Schwob.

Writer Francisco Zamora and his wife in their home in Los Angeles. The couple are seen here in 1967.

[illegible]

So successfully did the monster in our language and culture that he began a career as a public speaker, travelling from city to city giving rousing speeches in favour of his aboriginal brethren.



emulsified lubrication

Methods of applying lubrication.
(1) Mr. C. C. Moore and John W. H. Smith, *Research Engineers*
Philadelphia, described with many color photographs of lubrication

supply horizontal under pressure. If the flow is to move from one point, the arrangement is a centrifugal lubrication system; if the oil is returned to the pump, it is closed on a recirculating system. In air-oil-oil-air lubrication a supply of liquid is drawn into the bearing from a reservoir, and the return is made by a pump. In air-oil-oil-air lubrication the oil is drawn into the bearing from a reservoir, and the return is made by a pump. In air-oil-oil-air lubrication the oil is drawn into the bearing from a reservoir, and the return is made by a pump.

The countries and regions are the following: